FINAL DRAFT Concept of Operations for the Assignment, and Update of the Alteration Figure of Merit AFOM (AFOM) as an Element of the SHIPMAIN Decision Board Requirements Change Package (RCP)

I. Executive Summary: The SHIPMAIN Entitled Process Decision Boards will operate in an electronic/virtual environment forum that allows U.S. Navy O-6 and Flag Board members to vote (Evote) on the Recommended Change Package. The RCP forms a decision package that supports the Entitled Process block decision points associated with the initial execution of preliminary engineering (for conceptual design), and follow-on detailed engineering (for design/development), procurement and installation and final ship integration of an alteration. Three key decision aids will be provided as voting criteria for the board members at the O-6, 1-2 Star Boards and 3-Star Decision Boards: The AFOM, the Cost Benefit Analysis (CBA) and the Technical Assessment; the below sample RCP shows how the AFOM, CBA and TA data are displayed to the Board members.

The objective of the AFOM calculation is to quantitatively determine, via a weighted model, the Warfighting and Readiness Benefit of an alteration, known in the Entitled Process as a "ship change" and display an overall score and its associated contributions by other factors, expressed as a percentile, to the Decision Board members. These calculations, although not purely objective, do minimize the subjectivity associated with other weighted ranking or rating methods by using Analytical Hierarchy Process (AHP) modeling techniques to calculate the weights and input parameters. However, no model or process can automatically create a purely objective number. The goal of AFOM is to provide a decision aid and not an absolute score.

NOTE: *The calculation of the AFOM is a departure from the previous methodology used in the SHIPMAIN "Interim" process, whereby the O-6 Board members voted on each alt by assigning 1,3,5,7 values to each alteration and an average was calculated. This average was known as the Figure of Merit (FOM). Categories were created based on upper and lower FOM limits to assign each alteration to a "Must Do", "Crunch" or "Kill" zone. This method was chosen to rapidly prioritize and create the POM-06 Modernization Plan by dispositioning a batch of over 25,000 alterations residing in the Navy Data Environment (NDE) Database. However, this method is inherently subjective and does not realistically support the continuous flow of hundreds alterations that will enter NDE each month. In the AFOM process, O-6 Board members no longer "vote" to establish the AFOM and Must Do, Crunch and Kill zones are no longer created or used. As noted earlier, the AFOM is provided as a decision tool and must be considered along with other factors on the RCP, including CBA, Technical Assessment and other specific factors regarding the ship change before an "approval" or "disapproval" decision can be made.*

In summary, the AFOM is the numerical result of "how much" of an improvement a ship change provides combined with "how it measures up against overall "Big Navy" priorities". There are three steps in calculating the AFOM:

Step 1: The annual establishment of Capability and Suitability Priorities by the CNO and TYCOM members of the 3-Star SHIPMAIN Decision Board. A Merit Assessment Questionnaire (MAQ) completed by each CNO/TYCOM Board member and entered into a software program known as Expert Choice gathers these priorities. The MAQ asks each member

to provide judgments on each of the elements of the AFOM Benefit Structure (Figure 1) in a PAIRWISE fashion. Each Board member's input provides his or her unique perspective on overall priorities. These individual judgments are then collated into Expert Choice to provide a "normalized" overall priority, expressed as weights in the Benefit Structure. The AFOM Benefit structure contains specific criteria drawn from the Naval Power 21 Architecture and accepted Suitability attributes such as reliability, manpower, and training, Quality of Service/Quality of Life (QOS/QOL).

Step 2: Comparison of Fleet or Program Alterations against standardized Type Commander Rating Scales that map directly to AFOM Benefit Structure. Rating scales are chosen based on the mapping of the ship change against its functions listed in the SCD i.e. "what is the function of the ship change" in Warfighting or Readiness function. The Rating Scale indicates "how much of an improvement" the ship change provides once its "function" is captured.

Step 3: Numerically combining the TYCOM Rating Scale inputs with the AFOM Benefit Structure 3-Star Board Weights as the sum of AFOM Benefit weights times the applicable rating scale inputs to form a raw score. The raw score is converted to a percentile based on how the ship change's score compared against all other ship changes in the current Entitled Process Phase I, II or III population. This Process is shown in the figure below:
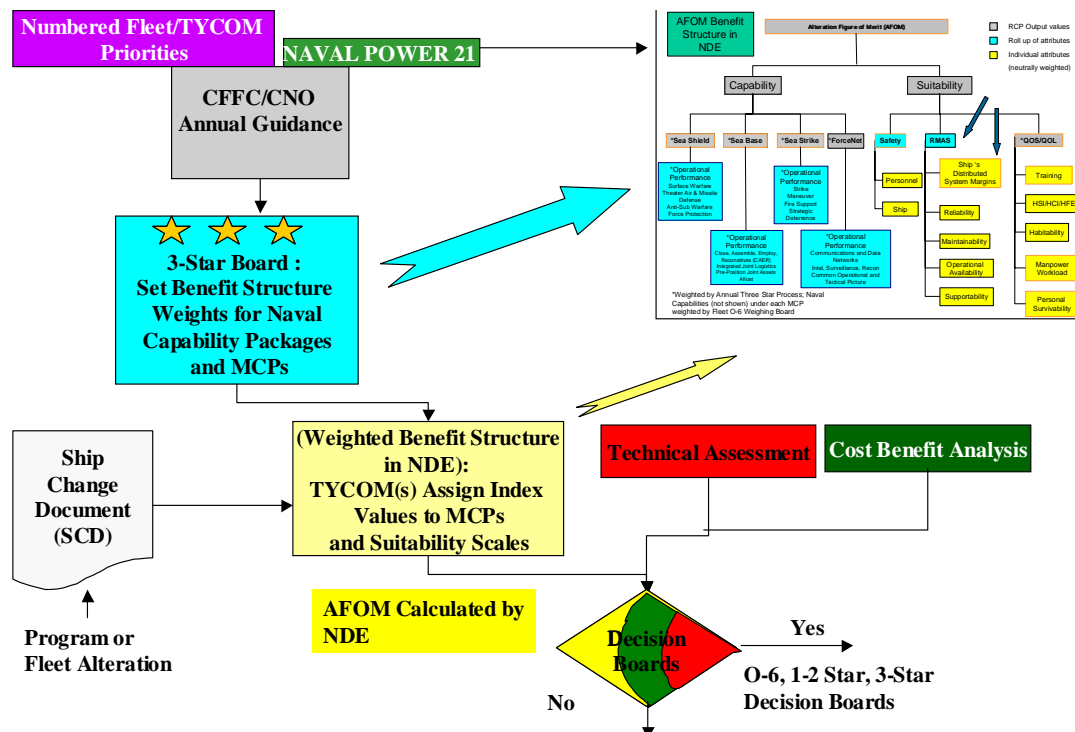
This paper will address both parts of the AFOM calculation process and will encompass:

A. Definition of AFOM for the Entitled Process

B. Command and Staff Relationships in determining Warfighting and Readiness Priorities.

C. Information Exchange Requirements between various commands and staffs

D. Affected Enterprise Data Environments including sources and repositories of requirements and capabilities data

E. Information Workflow from requirements definition to AFOM calculation.

F. General Description of the algorithm that calculates AFOM.

G. PARM/SPM or other submitter responsibilities for data entry to capture attributes critical to AFOM calculation from the Ship Change Document (SCD).

H. The general process by which an individual SCD is assessed against TYCOM rating scales to calculate the AFOM.

II. AFOM Definition and Calculation Overview: The AFOM is defined as a quantitative articulation of the Warfighting, QOS/QOL and Readiness Benefit of a Fleet or Program ship change based on the Benefit Criteria mentioned earlier and shown in **Figure 1**. It is the measure of "warfighter value added" of a hardware, software or other change to U.S. Navy Surface ships and is determined independently of the other RCP parameters (Cost Benefit and Technical Assessment). Summary characteristics of the AFOM:

A. Calculation of the AFOM occurs at various points along the development timeline of a proposed alteration and includes initial assignment and confirmation/adjustment steps as part of the overall SHIPMAIN process.

B. AFOM is assigned during the Preliminary Technical Review phase of the Technical Assessment and initial CBA and then updated twice more (if needed) during the Detailed Technical Review and Final Technical Review (following Phase I, II and III respectively of the Entitled Process).

C. AFOM is determined by assigning an index value for multiple criteria, which is then "rolled up" in the

weighted AFOM Benefit Structure to produce an overall AFOM and contributing AFOMs for Capability, Suitability, QOS/QOL, and each of the Naval Power 21 Naval Capabilities (aka Pillars). AFOM is then calculated and assigned an initial value and updated/confirmed as necessary throughout the development cycle of a SCD. As noted earlier, the AFOM is converted to a percentile score to show the relative standing of the ship change against the population of changes in each phase. An SCD is never compared against ship changes in other phases of development.

    D. The numerical weights for the AFOM Benefit Criteria are developed by the 3-Star (O-9) board via a Merit Assessment Questionnaire (MAQ), which queries the members as to the relative importance of each standard compared against the others. The 3-Star Board members who provide answers to the assessment questionnaires are Fleet/OPNAV O-9 members of the SHIPMAIN O-9 Decision board; PEOs and SYSCOM members may advise other Fleet Members, but will not participate in the questionnaire process.

    E. **(NOTIONAL/TBD)** The 3-Star Board completes the MAQs during the first quarter of the fiscal year to set the weights for the annual cycle.

    F. *(NOTIONAL/TBD)* Guidance for Weighting of the Benefit Structure will be provided by a Board Precept letter, signed by FFC N00 with inputs provided by the Numbered Fleets, TYCOMs and OPNAV Campaign Analysis Process. The Precept will indicate which high-level Naval Capabilities, MCPs and Capabilities should be emphasized, de-emphasized or remain unchanged per TYCOM, OPNAV and Numbered Fleet inputs. For example, the NP-21 Naval Capability "Sea Strike" and its associated Mission Capabilities Packages (MCP) may be weighted more heavily by the board members than the "Sea Basing' or "Sea Shield" Naval Capabilities and MCPs. This will depend on the periodic analysis of requirements and gaps in capability that will be conducted by Fleet Forces Command (FFC) and the CNO Warfare and Assessments divisions as part of the Board Precept process.
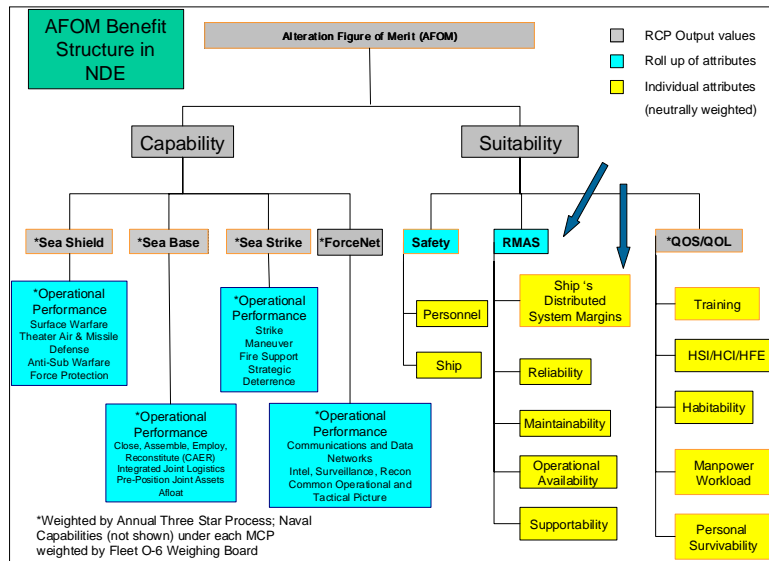
FIGURE 1: AFOM BENEFIT STRUCTURE

III. Phase I: Developing the AFOM Benefit Criteria Weights

(Precept Concept TBD) As discussed earlier, the AFOM Benefit Criteria Weights must be established and implemented in order to compare the SCD's benefit against the weighted criteria. Determination of priorities in support of weight calculations will be the responsibility of Fleet and CNO Staffs, who will conduct an analysis of requirements and articulate needs and gaps in capabilities or readiness as inputs to the 3-Star Board weighting process. This will normally be articulated via a Precept, which may take the form of a Personal-For (P4), Naval Message or Web-Interactive Post as determined by Fleet Policy. The precept is envisioned to capture issues as high-level "Guideposts" only and should not be system-specific or recommend specific technical solutions.

1. Command and Staff Relationships for completing the Annual O-9 (3-Star) Merit Assessment Questionnaire and Precept Creation: The provisional lanes of responsibility for determining user needs and articulating Warfighting requirements, readiness and capabilities shortfalls in support of this process are defined as follows. The overall notional process is shown in **Figure 2**.

A. Fleet Forces Command (FFC):

(1) **(TBD)** FFC is the Process Owner for AFOM and will assimilate and prioritize issues and requirements from lower-Echelon commands and Numbered Fleet Commanders; they will be closely associated with CNO N6/N7 Codes as part of the overall Naval Capabilities Development Process (NCDP) and its related Virtual SYSCOM Process. These requirements will be mapped to Specific NP-21, various codified ROADMAPS and Master Plans, to determine gaps in capability or readiness determined from the current President's Budget or Program Objective Memorandum (POM)/Program Review (PR).

(2) FFC will also ensure that acquisition programs are factored in via assimilation of Capstone Requirements Documents (CRD), Capability Development Document (CDD), and pre-existing/applicable Mission Needs Statements (MNS) and corresponding Operational Requirements Document (ORD), including ACAT programs.

(3) The following agencies will support FFC during this phase of the process by collecting issues and requirements as follows:

- COMNAVNETWARCOM: All C5I Requirements from TYCOM N6 staffs and Numbered Fleets.
- CONUS Numbered Fleet Commanders: Readiness and Warfighting Issues.
- Platform or System Operations Advisory Group (OAG): Executive Steering Committee (ESC) "Top Ten" or other priorities.
- COMNAVSURFOR/COMNAVAIRFORCE/COMINEWARCOM (CNSF/CNAF/CMWC) N43: Collect and forward to FFC N43: All Hull, Mechanical and Electrical, Distributed Systems and Platform-level Requirements including TMA/TMI and CWP/ERM candidates. In addition, the Type Commanders will articulate INSURV Habitability, Material and Mandatory Safety Issues.

(4) Will issue and maintain a standardized, subjective Merit Assessment Questionnaire (MAQ). This questionnaire will be promulgated annually via a TBD Web-Based application or site.

(5) Provide notification to the SHIPMAIN 3-Star Board and SEA 04RP when updates to the AFOM Benefit structure and/or weights are required in support of changing Navy Policy or emergent world events.

B. CNO Warfare Assessments division (N6/N7, N81):

(1) **(NOTIONAL)** With the assistance of CNO N70 codes, N42 and N61, will coordinate and develop, via Campaign Analysis/SEA TRIALS, Mission Capability Packages (MCP) that delineate gaps (or overlaps) in requirements against specific NP-21 Capabilities. MCPs or their equivalent will be used as source data by FFC N8 to both articulate Navy Wide Warfighting and Readiness priorities in the Board Precept Letter and roll-up requirements for a Fleet Panel AFOM assignment to the SCDs.
(2) **(NOTIONAL)** Assist FFC N8 in developing an enclosure to the Board Precept that will articulate recommended priorities of the NP-21 Pillars and Navy/Joint Mission Essential Tasks associated with the outcome of the Gap Analysis and FFC Validated Requirements.

D. NAVSEA 04RP:

 (1) Input the PAIRWISE weights into NDE for subsequent change candidate evaluation/AFOM calculation at follow-on O-6, 1, 2 and 3 Star Boards.
(2) Modify and maintain the EXPERT CHOICE PAIRWISE tool as an offline development resource for maintaining and updating the AFOM Benefit Structure and weights.
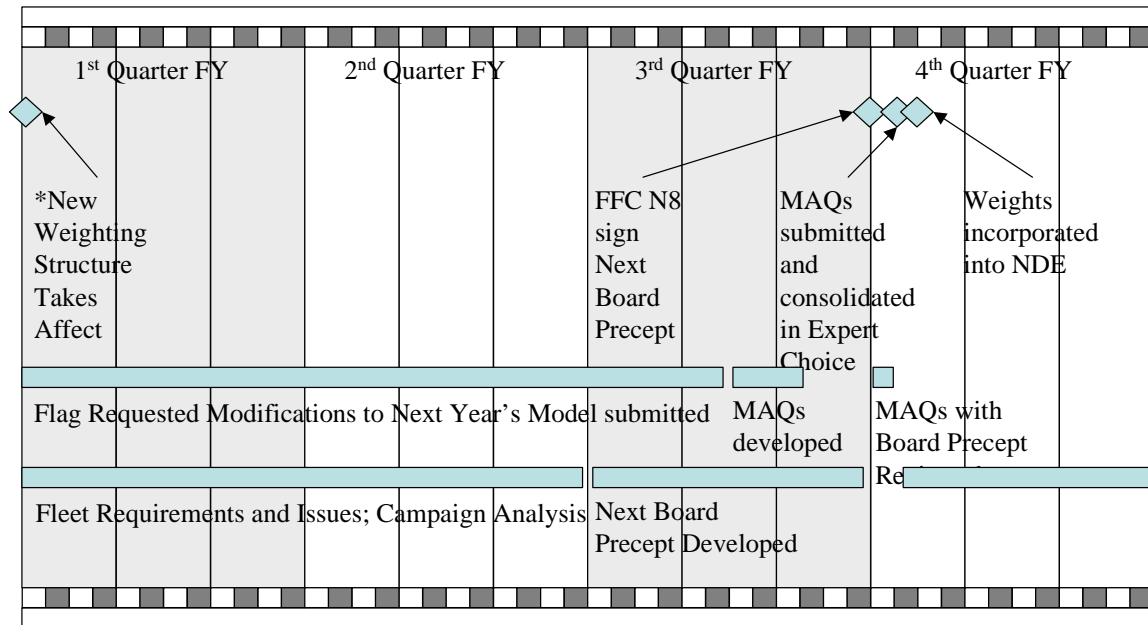
E. SHIPMAIN FLAG Decision Board Member Staffs:

(1) Obtain and assess FFC Precept and brief their respective Flags on recommendations.
(2) Prepare and submit completed Merit Assessment Questionnaire (MAQ) for approval to O-9 Board Member.

F. 3-Star Board Members: Provide pair-wise judgments on Merit Assessment Questionnaires (MAQ) provided by SHIPMAIN process for Naval Capabilities and the associated Mission Capability Packages (MCPs).

G. 1-2 Star and O-6 Board Members: Ensure 3-Star Board Precept is used as overarching guidance for the 1-2 Star and O-6 Boards as appropriate during Board meetings/convenings.

Annual View of the AFOM Weighting Assignment Process (Entitled State)

	1st Quarter FY	2nd Quarter FY	3rd Quarter FY	4th Quarter FY
	*New Weighting Structure Takes Affect		FFC N8 sign Next Board Precept	MAQs submitted and consolidated in Expert Choice	Weights incorporated into NDE
	Flag Requested Modifications to Next Year's Model submitted		MAQs developed	MAQs with Board Precept Re...
	Fleet Requirements and Issues; Campaign Analysis		Next Board Precept Developed	

*Starting in October 2005

Figure 2: 3-STAR BOARD AFOM BENEFIT WEIGHTING PROCESS (NOTIONAL)

IV. Phase 2: Calculation of the AFOM

Once the AFOM Benefit Criteria weights have been established and entered into NDE (via Expert Choice), individual alternatives will be evaluated and the AFOM calculated for each SCD. The Type Commanders who will enter index values on a standard rating scale for 12 Standard Suitability criteria and the applicable Mission Capability Packages (MCP) associated with one or more of the 61 Naval Capabilities that are selected by the submitter on the SCD when the Program or Fleet Alteration is entered into NDE will accomplish this. By selecting specific capabilities, the TYCOM will be cued to rate only those criteria that

apply to the alteration. For HM&E alterations, applicable capabilities under the SEA Base Naval Capability will be selected as a default to ensure that the alterations is assessed for its capability contributions to mobility, etc. HM&E alterations may also map to other capabilties as well. For example, a chilled-water upgrade to the AEGIS weapons system SPY radar would be rated under the SEA SHIELD "Theater Air and Missile Defense" MCP and its applicable Naval Capabilities.

The rating scale values are then multiplied and rolled-up by the weights set by the 3-Star Board to complete the AFOM calculation process. A percentile score is calculated for the Overall AFOM along with the associated contributions (scores) for the Capability, Suitability, QOS/QOL and Naval Power 21 Pillar. All of these scores appear on the RCP to assist the Decision Board member by displaying various levels of detail for the AFOM.

1. **Command and Staff Relationships in calculating AFOM**:

A. SPM/PARM or Submitter: Enter SCD data into NDE to capture key attributes of each candidate in support of AFOM as discussed. References that are needed by the TYCOM staffs should be provided to support AFOM Rating Scale assessment.

Key attributes will be captured to assess the AFOM and the AFOM algorithm in NDE will calculate a numerical value as noted earlier. The AFOM for Fleet Commander Expedite, Statutory, Mandatory Safety and Conjunctive will receive an additional alphabetical attribute (in parenthesis) next to the AFOM score denoting it as a special case as noted below; Statutory SCDs will automatically receive a maximum AFOM score of 100 (percentile) as a default.

A. Expedite (F)
B. Statutory Requirements (S)
C. Mandatory Safety (M)
D. Conjunctive Alterations (C)
E. Joint Interoperability (J)
F. TMA/TMI (T)

The NDE algorithms will filter/parse out specific data to achieve this objective and provide this along with the AFOM to the RCP.

B. TYPE COMMANDERS (TYCOM):

Will assign rating scale values in NDE based on inputs received from staff and external subject matter experts. Inputs and outputs to the AFOM process will be via a single point of contact on each TYCOM staff, known as a "Portal". The Portals will provide the final AFOM Rating scale values and "Assign" the AFOM by electronically stamping the SCD. Each TYCOM staff will also have SCD Managers corresponding to C5I and HM&E ship changes as necessary. The SCD Manager's serve as the TYCOM Portal's conduits to ensure ship changes are adjudicated in a timely manner and reach the correct SMEs for rating scale inputs. **Figure 3** outlines the SCD flow to, from and within the TYCOM Staff Organizations.
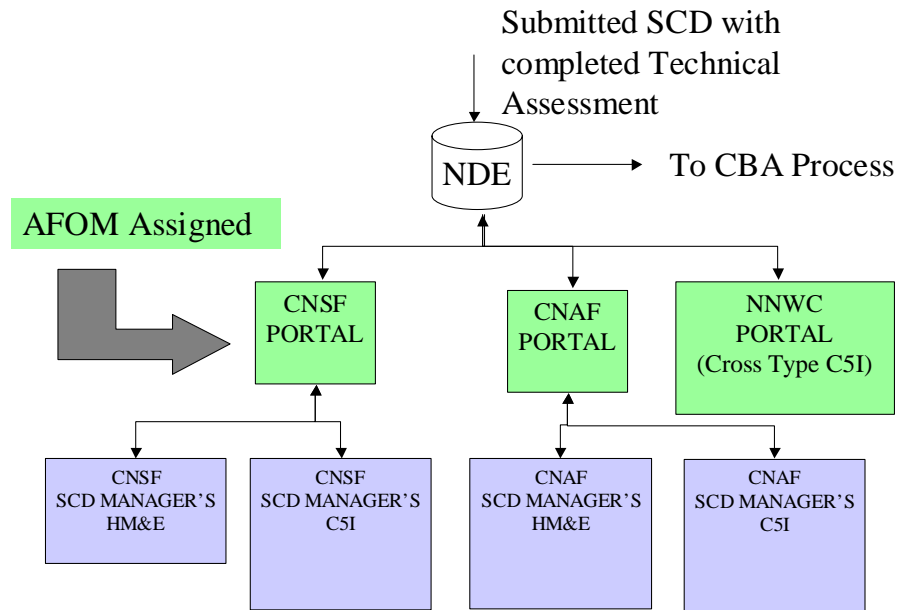

Figure 3: TYCOM SCD Flow to Assign AFOM

3. Affected Enterprise Data Environments and COTS Software Modules:

SHIPMAIN will align or interface several Enterprise and non-Enterprise data environments or COTS software applications. For the purposes of AFOM calculation, these will include NDE, NTIRA and a non-Enterprise application, Expert Choice. These data sources and software applications provide critical data across the spectrum of required data

to support the three key decision aids mentioned earlier: AFOM, CBA, and TA.

A. NDE:

(1) SCD Data Entry: Per SHIPMAIN policy, all ship changes will be entered into NDE using the Ship Change Document (SCD). The SCD will allow PM/PARM/SPM or submitter entry of data critical to mapping the proposal to a NP-21 capability or capabilities. The mapping to specific SEAPOWER Pillars etc. will also occur as key attributes associated with AFOM calculation are parsed out of the inputs.

(2) Serve as the data repository for Merit Assessment Questionnaires (MAQ), AFOM Benefit Structure and final weights for the AFOM Benefit Criteria established by the 3-Star Board.

B. NTIRA: Will serve as a data mine to provide a SHIPMAIN requirements and interoperability analysis toolset to collate, assess and rank Warfighting and Readiness Priorities as well as cross-program dependencies and interoperability considerations. It will serve as the analysis and presentation tool to provide the appropriate level of knowledge and background for the TYCOMs to assign rating scale index values in order to properly assess each SCD. It has the following general capabilities:

- NTIRA currently holds data on all C4I systems that are currently planned through the FYDP, including systems that are not yet deployed but are expected to be in the coming years. The capability rankings (NMETL) are for all C4I systems that have been ranked by the CFFC process, and only cover systems that are already deployed.

NTIRA provides selectable displays for illustrating capabilities and gaps/overlaps by Force, Battle Group or Platform against NMETLS, JMETLS, SP-21 Pillars and MNS/ORD requirements.
Limitations: NTIRA is limited to current (in service) C4I and some C5I systems and does not address Hull, Mechanical and Electrical (HM&E) that are not conjunctive alterations in support of C5I alterations, nor does it fully account for future systems (in development) requirements analysis.

Mobility NMETLS and Common Systems Functions List may be developed to support HM&E systems in the future.

C. EXPERT CHOICE: Expert Choice will remain as an offline developmental resource and will be used to enter the 3-Star MAQ information and extract AFOM Benefit Structure Weights that are then entered in the NDE AFOM algorithm. It will allow the PAIRWISE calculation of the AFOM Benefit Criteria weights vs. objectives/tasks upon entry of subjective preferences by the 3-Star Board voters. Future capabilities may include integration of Expert Choice Enterprise applications to provide additional or total automation of the AFOM process beyond the Initial Automated Entitled Process Baseline of the NDE-NM software release scheduled for late spring 2005.